APPENDIX B

COMMENTS RECEIVED ON THE NOP AND INITIAL STUDY

COMMUNITIES FOR A BETTER ENVIRONMENT

April 26, 2005

Jack Broadbent
Air Pollution Control Officer
Bay Area Air Quality Management District
939 Ellis Street
San Francisco, CA 94109

Attention: Alex Ezersky, Principle Air Quality Specialist

Re: **Notice of Preparation of Draft Environmental Impact Report and Initial Study for adoption of District Regulation 12: Miscellaneous Standards of Performance, Rule 12: Flares at Petroleum Refineries and Amendment of Regulation 8: Organic Compounds, Rule 2: Miscellaneous Operations; preliminary comments of Communities for a Better Environment (CBE)**

Dear Air Pollution Control Officer Broadbent:

Communities for a Better Environment ("CBE") respectfully submits the attached comments on the Bay Area Air Quality Management District ("District") Notice of Preparation of Draft Environmental Impact Report ("EIR") and Initial Study cited above, and reserves the right to submit additional comments. As noticed, the project ("proposal") is the District's proposal to adopt new Rule 12-12 controlling oil refinery flares and to rescind the applicability of existing Rule 8-2 to these emission sources.

CBE supports the preparation of a draft EIR for this proposal. However, the Initial Study does not appear to set up a balanced, complete or accurate evaluation. It identifies the wrong impacts for evaluation in the draft EIR, misses significant adverse impacts of the proposal, and ignores feasible alternatives that can avoid these impacts and better reduce flare emissions.

The Initial Study suggests no serious evaluation of localized air pollution impacts, no evaluation of environmental justice impacts and no evaluation of water quality impacts caused by flare emissions the proposal seeks to reduce. It suggests no serious analysis of prevention actions to reduce flare emissions – or of how these actions prevent upsets. Instead, it wrongly assumes that the proposal could cause refinery upsets. Further, it fails to identify the potential for significant impacts on environmental justice if, as now proposed, the proposal inappropriately limits public participation in decisions on enforceable flaring standards. Finally, it does not identify known, feasible alternatives that could avoid these impacts of the proposal while better reducing flare emissions and better preventing refinery spills, fires and explosions.

1611 Telegraph Avenue, Suite 450 • Oakland, CA 94612 • T (510) 302-0430 • F (510) 302-0437

In Southern California: 5610 Pacific Blvd., Suite 203 • Huntington Park, CA 90255 • (323) 826-9771

Jack Broadbent and Alex Ezersky
April 26, 2005
Page two

As detailed in our attached preliminary comments on the scope of the flare control rule EIR, CBE recommends that the draft EIR should:

1. Reject the assumption that the proposal increases refinery upset risk;
2. Reject the assumption that the proposal can not prevent significant refinery upsets;
3. Evaluate the actions that the proposal could require for their inherent safety and their ability to help in the prevention of significant refinery upsets;
4. Identify and evaluate all pollutants emitted by refinery flares;
5. Estimate episodic and average emissions quantitatively for each pollutant emitted by flares during the 2001-2002 period, the 2004 period, and after full implementation of the proposal;
6. Re-evaluate data and engineering judgments used in flare emission estimates for 2001-2002 and 2004 in order to more accurately estimate the potential to pollute;
7. Estimate and evaluate the spatial concentration (tons/square mile), frequency, and timing of flare emission episodes near each refinery during 2001-2002, 2004, and after full implementation of the proposal;
8. Evaluate ambient monitoring before, during and after all flaring that resulted in a local concentration of emissions/square mile for all pollutants emitted by flares at fence line, local, and regional (comparison) monitoring stations;
9. List all community members' reports of odors and other symptoms during or after flaring and map these exposures by refinery for public review and comment on the draft EIR;
10. Evaluate potential cumulative health effects of localized exposures to flare plumes and include in the evaluation a precautionary analysis that considers the limitations of current monitoring and scientific tools;
11. Evaluate cumulative impacts of past and ongoing environmental injustice on communities that are disproportionately exposed to flare plumes;
12. Compile and analyze demographic data at a level of detail capable of distinguishing differences in race, ethnicity, age, income and wealth in locally impacted neighborhoods from those in communities more distant from refineries and other large sources of emissions;
13. Evaluate the potential impacts of flare PAH, mercury and dioxin emission fallout on water quality and aquatic life in the San Francisco Bay catchment and on subsistence anglers;
14. Evaluate the potential for disproportionate impacts on refinery workers and neighbors caused by spills, fires and explosions resulting from refinery upsets;
15. Evaluate potential impacts on low-income communities, on government services, and on the public resulting from gasoline and diesel price spikes caused by major refinery upsets;

Jack Broadbent and Alex Ezersky
April 26, 2005
Page three

16. Identify and evaluate impacts of the proposal, as proposed February 15, 2005, on meaningful participation by members of low-income communities of color adjacent to refineries in decisions that define enforceable flaring standards;
17. Evaluate the alternatives to the proposal identified by CBE on April 11, 2005, and by Plumbers and Steamfitters Local 342 on April 14, 2005, and compare these alternatives with the proposal for all potential impacts and environmental effects that are identified;
18. Evaluate the need for independent audits of refinery gas recovery systems, both to identify deficiencies which lead to routine flaring, and as mitigation for any potential impacts resulting from refiners' inability to determine adequately when flaring is needed for safety;
19. Evaluate the need to clarify requirements that oil companies are responsible for the safety of their refineries at all times, as mitigation for any potential impacts resulting from refiners' inability to determine adequately when flaring is needed for safety; and
20. Evaluate the need for placing independent expert operators in refineries, as mitigation for any potential impacts resulting from refiners' inability to determine adequately when flaring is needed for safety.

Thank you for inviting our comments on the scope of this environmental review. Please let me know if you or your staff has a question regarding these comments.

In Health,

Greg Karras
Senior Scientist

Attachments: Comments of CBE on scope of flare control rule EIR
Review of BAAQMD Reassessment of Flare Emissions for Historical Period

Copy: Alan Lloyd, Agency Secretary, California EPA
Catherine Witherspoon, Executive Officer, Air Resources Board
Dean Simeroth, Criteria Pollutants Branch Chief, Air Resources Board
Erik White, Manager, Engineering Evaluation Section, Air Resources Board
Tim Dunn, Air Pollution Specialist, Air Resources Board
Dan Belik, Rule Development Manager, Bay Area Air Quality Management District
Wendel Brunner, Director of Public Health, Contra Costa County Health Services
Michael Kent, Contra Costa County Health Services
Richard Drury, Adams Broadwell Joseph & Cardozo

Comments of CBE on scope of flare control rule EIR **April 26, 2005**

The Initial Study has not analyzed potential effects on refinery upsets accurately.

The Initial Study ***assumes*** (incorrectly) that the proposal could result in adverse air quality, hazards and hazardous materials impacts by causing increased risk of upsets.[1] The proposal would ***not*** result in these impacts. It allows flaring at any moment when gases cannot be recovered and reused safely.[2] In no other circumstance could prevention of flaring cause the "increased risk of accident, fire and direct release of hazardous materials to the atmosphere" that the Initial Study alleges.

Equally important, the Initial Study ***assumes*** (incorrectly) that the proposal could not prevent significant refinery process upsets.[3] As the Initial Study acknowledges, "each refinery will have to submit plans to ***reduce flaring in all circumstances*** and adhere to those plans" and "conduct causal analysis of flaring events."[4] Feasible actions refiners could be required to plan and implement to reduce flaring in all circumstances include:

Root cause analysis and implementation of feasible prevention measures identified.[5]

Maintenance, equipment upgrades and installation of redundant back-up systems at failure-prone points in processing systems to prevent repeated malfunctions.[6]

Audits and adjustments or upgrades of compressors, gas treatment, processes and operations to moderate the amounts of gases produced and increase recovery system capacity.[7]

These actions avoid flaring by preventing sudden changes in gas quantity, quality or reuse capacity and ensuring adequate gas recovery margins – they prevent upsets.[8] They are inherently safer.[9] District staff itself has reported a relationship between reduced flare emissions and actions to avoid upsets: "Plants whose operators maintain stable processes in equilibrium with the plants capacity for using flare gas have lower emissions."[10] Refinery neighbors observe the effects of this causal relationship, and recognize repeated episodes of increasing flaring as symptomatic of

[1] Initial Study at 3-2, 3-5, 3-10, 3-18, 3-22, 3-23, 3-40 and 3-41.
[2] See Section 12-12-301 of the draft rule as proposed 2/15/05; 4/11/05 comments of CBE et al. on the draft rule, and 4/14/05 comments of Plumbers and Steamfitters Local 342 on the draft rule.
[3] Initial Study at 3-9 ("The proposed rule would not have an impact on a process upset of this magnitude." The preceding sentence shows "this magnitude" refers to "a significant process upset in the refinery.")
[4] Initial Study at 3-8. Emphasis added; and sections 12-12-302, 12-12-401 and 12-12-406 of the draft rule.
[5] See 4/11/05 comments of CBE et al. and sections 12-12-301, 12-12-401.9 and 12-12-406 of draft rule.
[6] See 4/11/05 comments of CBE et al. and sections 12-12-205, 12-12-301 and 12-12-401.6 of draft rule.
[7] See 4/11/05 comments of CBE et al. and 12-12-208, 12-12-301, 12-12-401.4, 12-12-401.5, 12-12-406.
[8] See 4/11/05 comments of CBE et al. on the draft rule.
[9] See 4/14/05 comments of Plumbers and Steamfitters Local 342 on the draft rule.
[10] AQMD, 1990. Results of Flare Gas Monitoring in the BAAQMD March 1988 through December 1989.

process imbalances that, if uncorrected, may result in major upsets. The proposal would help to prevent upsets in all circumstances that may result in flaring; including the prevention of significant refinery upsets.

For example, contrary to oil industry backers' suggestions, a causal investigation by Contra Costa County did ***not*** identify flaring prevention as a cause of the Avon Refinery hydrocracker explosion that killed Michael Glanzman on January 21, 1997. This explosion ***was*** caused (in part) by multiple repeated equipment and instrumentation malfunctions that contributed to operators' inability to detect and respond to abnormal process temperatures, and ***also*** caused flaring ***before*** the explosion.[11] The proposal's requirements to prevent repeated malfunctions that cause flaring might avoid such tragic incidents in the future.

Instead of causing adverse impacts from process upsets as the Initial Study claims, the proposal's prevention requirements could reduce these ongoing impacts by helping to prevent refinery upsets – assuming that the prevention requirements are enforced.

Thus, the problem in the oil industry's opinion, that refiners may not know whether or not to direct gas to flares at times when flaring is needed to avoid a risk of serious upset,[12] is independent from this proposal, except that the proposal could mitigate this problem. The proposal could mitigate the problem because required prevention actions could reduce the number of times such future decisions to control upsets would have to be made. The problem can also be mitigated by clarifying that the companies are responsible for the safety of their plants at all times, and by using independent experts to operate the processes in question until the refiners ensure this obligation is met. It can also be mitigated by the independent audits of gas recovery systems that a refinery workers' union recommends.

Plumbers and Steamfitters Local 342 state "a crucial need for independent audits of refinery compressor gas recovery systems to identify deficiencies which lead to routine flaring" and recommend that the District should perform such audits.[13] Such audits would, of course, also clarify how much gas recovery capacity is available during future upsets ***before*** they occur.

However, this problem alleged by the industry – that refiners do not know how to operate their refineries safely – can ***not*** be mitigated by the industry's suggestion to make the proposal's upset prevention requirements unenforceable. That would be counterproductive. The EIR should not consider weaker prevention standards as mitigation for this alleged problem.

[11] See Alton and Brown, 1997. Summary Report to the Board of Supervisors on the Investigation of the Causes of the Tosco Avon Refinery Incident of 1-21-97. Contra Costa County Health Services Department. May 29, 1997.

[12] "Western States Petroleum Association and its members … are of the opinion that the rule may affect a refinery operator's decision to flare or not, and that this impact on the decision making process may compromise the safe operation of the refinery. If gas is directed to the flare, then the operator may be in violation of the rule. If the operator does not direct gas to a flare, there may be an increased risk of accident, fire and direct release of hazardous materials to the atmosphere." See page 3-10. The same passage appears on pages 3-22 and 3-23 and on page 3-41. The alternative interpretation of WSPA's argument – that the industry intends to violate the prevention requirements and may risk safety problems to cover up its violations – must be rejected as unethical.

[13] See 4/14/05 comments of Plumbers and Steamfitters Local 342 on the draft rule.

Comments of CBE on scope of flare control rule EIR **April 26, 2005**

The draft EIR should analyze localized air quality impacts.

The Initial Study does not adequately identify or evaluate localized impacts of flare emissions. The draft EIR should analyze these impacts. This is an environmental health and justice issue.

All pollutants emitted by flares should be included in the analysis. The Initial Study does not identify all the pollutants emitted by flares. Flaring petroleum gases emits NOx, carbon monoxide, hundreds of gas-phase and particulate-phase hydrocarbon and sulfur compounds such as benzene, toluene, xylenes, SO_2, H_2S and carbon disulfide, and other toxic chemicals.[14] Flares also emit toxic trace elements that are present in petroleum hydrocarbons[15] but cannot be destroyed by flaring. In particular, mercury present in refinery gases[16] emits from flaring. Flares also emit semi-volatile PAHs[17] and other highly toxic compounds formed during incomplete combustion of chemicals present in the vent gas. Importantly, observations of halogens in refinery process streams and products, observations of dibenzofuran in flare emissions, and evidence that dioxins emit from landfill gas flares suggest that dioxins emit from refinery flares under some conditions.[18] Each pollutant that the available evidence suggests may emit from flares should be identified and evaluated by the draft EIR.

Emissions should be estimated for each pollutant emitted by flares under potential-to-pollute, partial implementation, and full project implementation scenarios. The Initial Study cites District staff's emission estimates – based on direct measurements, analogous measurements and engineering judgments regarding volume and composition of vent gases flared and combustion efficiency – for the 2001/2 period as well as the 2004 period reflecting partial implementation of controls. However, these District estimates are limited to total hydrocarbons and sulfur compounds. The Initial Study does not identify any of the other pollutants discussed above for development of emission estimates. Such estimates can be developed from available information. For example, mercury emissions can be estimated based on measurements of gas flow and

[14] See e.g., Strosher, 1996. Investigations of Flare Gas Emissions in Alberta. Environmental Technologies, Alberta Research Council, Calgary, Alberta; Leahey et al., 2001. Theoretical and Observational Assessments of Flare Efficiencies. *J. Air & Waste Manage. Assoc.* 51: 1610-1616; and EPA AP 42 data.

[15] See e.g., Block and Dams, 1978. Concentration-data of Elements in Liquid Fuel Oils as Obtained by Neutron Activation Analysis. *J. Radioanalytical Chemistry* 46: 137-144; Shah et al., 1970. Determination of Trace Elements in Petroleum by Neutron Activation Analysis. *J. Radioanalytical Chemistry* 6: 413-422; Nriagu and Pacyna, 1988. Quantitative assessment of worldwide contamination of air water and soils by trace metals. *Nature* 333: 134-139; Pillay et al., 1969. Neutron Activation Analysis of the Selenium Content of Fossil Fuels. *Nuclear Applications & Tech.* 7:478-483; and Wilhelm and Bloom, 2000. Mercury in Petroleum. *Fuel Processing Tech.* 63:1-27.

[16] See e.g., Wilhelm and Bloom, 2000 as cited above; and Wilhelm, 2001. Estimate of Mercury Emissions to the Atmosphere from Petroleum. *Env. Sci. Technol.* 35(24): 4704-4710.

[17] See e.g., Strosher, 1996 as cited above.

[18] See e.g., Block and Dams, 1978 as cited above (chlorine in crude, feedstocks and products); U.C. Riverside Center for Environmental Research and Technology, 1998. Evaluation of Factors that Affect Diesel Exhaust Toxicity. Submitted to ARB under Contract 94-312 (chlorine and dioxins in product); Strosher, 1996 as cited above (dibenzofuran measured in flare emissions); and BAAQMD, 1996. Air Emissions of Dioxins in the Bay Area (landfill gas flares estimated to emit 0.094 grams dioxin TEQ/yr). "Dioxins" refers herein to chlorinated, brominated and mixed chlorinated/brominated dibenzo-*p*-dioxins, dibenzofurans and PCBs that exhibit dioxin-like toxicity found to be additive by WHO TEQ analysis.

mercury in vent gases, refiner's crude slates, and engineering judgments about mercury partitioning in refineries and flare emissions,[19] but the Initial Study does not estimate mercury emissions. Source strength should be estimated quantitatively for each pollutant flares emit.

Further, current District estimates assume high (98%) hydrocarbon destruction efficiency during flare combustion despite evidence that incomplete combustion can result in significantly lower destruction efficiency for hydrocarbons (70% or lower in some conditions for inefficient small gas flares measured elsewhere).[20] Consider the flaring event shown below.

District staff originally reported total hydrocarbon emissions from this July 10, 2002 Rodeo Refinery event at 480-720 tons; then revised that estimate to a smaller 134 tons; then revised ***that*** estimate to about 50 tons based in part on the assumption of 98% destruction of hydrocarbons in

[19] See e.g., Draft Technical Assessment Document: Further Study Measure 8, Flares; Flare Monitoring Rule data; Wilhelm, 2001 as cited above (average and uncertainty Hg vent gas and wide range of Hg content in petroleum); and Regional Water Quality Control Board crude slate data from Se studies.
[20] See e.g., Leahy et al., 2001 as cited above; Strosher, 1996 as cited above; and Zastavniuk et al., 1999. Efficiency Measurements of Flares in a Cross Flow. *Presented at Combustion Canada 1999, Calgary.*

the material flared.[21] This combustion efficiency assumption surely appears unreasonably high, given evidence that the flare was overwhelmed and smoking severely. The potential error of the 98% efficiency assumption is significant. While Bay Area flare efficiencies remain unmeasured, if, for example, 25% of the gas flared in 2001/2 burned at 90% efficiency, the District's "baseline" hydrocarbon emission estimate would double.

In addition to the large potential combustion efficiency error, assumptions and omissions regarding flare gas flow and composition result in a potential error of approximately 37% in the District's hydrocarbon emission estimate for the 2001/2 period.[22] An adequate analysis of the potential to pollute must evaluate the high-emission side of the range of reasonably likely gas flow, composition and (at least for hydrocarbons) destruction efficiency for flaring events.

Source strength should be estimated quantitatively for each pollutant emitted as industry-wide daily averages and for facility-specific incidents, during the 2001/2 and 2004 periods as well as for full implementation of the proposal. These emission estimates should include combustion efficiency, gas flow and gas composition evaluations that account for the potential to pollute.

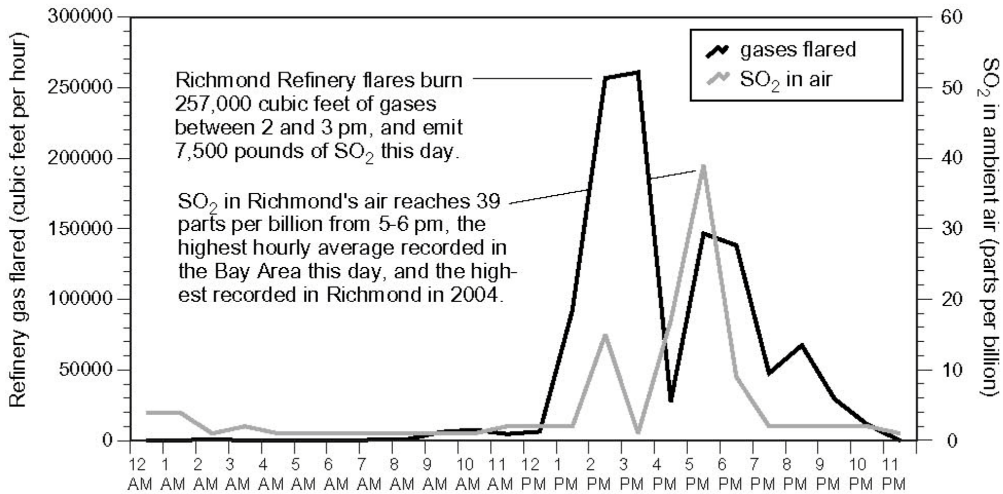
<u>The spatial concentration of emissions caused by repeated large flaring events should be analyzed</u>. Episodic flare emissions concentrate initially near refineries. On a tons-per-square-mile basis, the concentration of flare SOx and/or non-methane hydrocarbon emissions within half a mile outside one or more Bay Area refinery fence lines exceeded the Air Basin average from all Bay Area sources on 185 days in 2004. Further, it was at least ten times and up to 490 times this average on 70 days in 2004.[23] Despite a significant reduction in the volume of gases flared in 2004 compared with prior years, on average, flaring still causes concentrated emissions in a nearby community every other day.

The draft EIR should estimate and evaluate the spatial concentration (tons/square mile), frequency, and timing of these disproportionately concentrated flare emission episodes near each refinery during 2001/2, 2004, potential-to-pollute, and full implementation conditions.

<u>Direct measurements of ambient air quality should be evaluated before, during and after repeated flaring events that cause locally concentrated emissions</u>. Measurements outside the Bay Area show that refinery emissions of benzene, toluene, xylenes and other pollutants contribute significantly to localized air pollution.[24] Measurements of Bay Area air quality are available at the fence line, neighborhood and regional scales. For example, SO_2 reached the highest hourly average concentration recorded in Richmond all year and the highest concentration recorded in the Bay Area that day during flaring by the Richmond Refinery that emitted about 3.4 tons of sulfur compounds (as SO_2) on April 21, 2004. See the chart below.

[21] Review of BAAQMD Reassessment of Flare Emissions for Historical Study Period. (See attached.)
[22] Review of BAAQMD Reassessment of Flare Emissions for Historical Study Period. (See attached.)
[23] Based on data from the Flare Monitoring Rule as reported by BAAQMD, the Air Resources Board's 2004 emission inventory and area estimate for the SF Bay Area Air Basin, and refinery land areas from previous EIRs. The average concentration of emissions from all sources in the Bay Area is calculated as 29.5 lb/mi^2 SO_2 (71.57 TPD/5,340 mi^2) and 170 lb/mi^2 ROG (412.85 TPD/5,340 mi^2) from ARB data.
[24] See e.g., Zhao et al., 2004. Source Identification of Volatile Organic Compounds in Houston, Texas. *Environ. Sci. Technol.* 38(5): 1338-1347.

Sulfur dioxide in air at 7th Street, Richmond during flaring by Chevron on April 21, 2004.[a]



[a] Based on Flare Monitoring Rule data as reported by BAAQMD and ambient monitoring station data as reported by the Air Resources Board web sites.

The draft EIR should evaluate ambient monitoring before, during and after all flaring that results in a high local concentration of emissions/square mile, for all pollutants emitted by flares, at all locations in the monitoring network, including fence line, local and regional (comparison) stations. This analysis should use the finest time scale (e.g., minute-by-minute if possible[25]) that can be evaluated with existing data.

Importantly, limitations of the existing ambient air monitoring network that preclude complete measurement of flare plumes near refineries should be evaluated rigorously. The contribution of source emissions to local ambient air pollutant concentrations at fixed monitoring stations varies with wind speed and direction.[26] Thus, the ambient monitoring network will only measure the flare plumes locally when weather conditions send the plumes to the sampling probes at local monitoring stations, and the pollutants emitted are being measured at those stations.

The Initial Study states that the District "maintains a comprehensive monitoring network to assess air quality."[27] However, there are too few local stations monitoring too few pollutants to measure all flare pollutant plumes. Further, most stations in the network were intentionally located so that they would not measure plumes from nearby sources, because they were sited to monitor generalized ambient air. Preliminary analysis based on data reported on the District and Air Resources Board web sites confirms these limitations: all data for all pollutants reported from all stations in the existing monitoring network fail repeatedly to detect flare plumes, even

[25] See e.g., video monitoring of Chevron Richmond Refinery flaring on 3/23/05 suggesting that flare emissions can vary on this time scale.
[26] See e.g., Zhao et al., 2004 as cited above.
[27] Initial Study at 3-8.

from multi-ton-per-day events. Therefore, the draft EIR's evaluation should also include other available observations that provide data on local air quality during and after flaring events.

Residents' observations indicating exposure to flare plumes should be compiled and evaluated from historic records. For more than 25 years refinery neighbors have contacted the District to report odors, burning eyes, sore throats, coughing, asthma attacks and other symptoms during and after flaring events.[28] These observed symptoms are also direct observations of increased short-term exposure. Far more complete sampling coverage (thousands of nearby residents who can smell or otherwise sense acute exposures as compared with the few existing monitoring stations near refineries) reduces the probability of false-negative results for high-concentration plumes. Further, efforts such as EPA's Passive Ozone Network of Dallas have demonstrated public involvement in air monitoring,[29] and have begun to overcome bias among some environmental "professionals" against community-generated data.

All community air pollution complaints from Contra Costa and Solano counties in the District's possession should be compiled for the longest period practicable. All individual reports indicating visible refinery flaring before or during observations indicating exposure to a pollutant plume (e.g., odor; burning eyes) should be included without censoring data, given past problems in the complaint process.[30] All such data should be reported by refinery, symptom(s) and date; and should be listed and mapped by location around each refinery in the draft EIR, for community members to review in order to identify any omissions in the District's database.

Health effects that may be associated with flare emissions should be evaluated. The draft EIR should evaluate localized health effects due to flaring. Exposure to combinations of the pollutants emitted by flares (see above) can cause respiratory and eye irritation, asthma attacks, chest pain, morbidity, neurotoxicity, reproductive problems, birth defects, increased death rates, and increased risk of cancer.[31] The draft EIR should identify these potential health effects.

Perhaps most important, adequate evaluation of potential adverse health impacts will require analysis of the limitations of monitoring and scientific understanding, and the relationship of the Precautionary Principle and Cumulative Impacts policies to analysis of these limitations. Current monitoring of exposures and health effects is incomplete. Limitations of presently available scientific tools preclude identifying and predicting every pollutant-induced health effect even when exposures are known. Implementation of cumulative impact and precautionary policies in response to these limitations is now a matter of state policy.

[28] Per. Comm. with refinery neighbors and CBE staff since 1978. See also Workshop testimony.

[29] See e.g., Varns et al., 2001. Passive Ozone Network of Dallas. *Environ. Sci. Technol.* 35(5): 845-855.

[30] The District recently acknowledged problems with the complaint process in this period. For example, in the past residents have repeatedly told CBE they were disappointed or offended by their experience with District's complaint process, were misunderstood, felt discouraged from filing complaints, and/or had chosen to stop participating in the process.

[31] See e.g., USEPA (IRIS); Office of Environmental Health Hazard Evaluation database; Pope et al., 2002. *JAMA.* 287(9): 1132-1141; CBE/Kids Against Environmental Pollution, 2001. State of the Neighborhood: Bayo Vista Youth Health Survey; Bowler et al., 1996. Adverse Health Effects in African American Residents Living Adjacent to Chemical Industries. *Journal of Black Psychology* 22(4): 470-496; and asthma data compiled by Regional Asthma Manag. Project and Contra Costa Asthma Coalition.

Environmental justice analysis should be included in the evaluation of impacts. The Initial Study identifies a potential for "sensitive receptor" locations, but fails to identify the demographics of the people exposed to localized pollution from flares, and even implies (incorrectly) that there are no significant residential land uses near the refineries.[32] These errors or omissions should be corrected. Historic and ongoing environmental injustice near Bay Area refineries is documented.[33] Evaluation of the cumulative environmental and socioeconomic effects of past and continuing environmental injustice is essential to an understanding of the environmental and socioeconomic consequences of decisions on the proposal.

US Census data on race, ethnicity, age, income and wealth should be compiled and analyzed on spatial scales adequate to distinguish the demographics of locally impacted neighborhoods for comparison with communities distant from major industrial and transportation sources. Other available information includes but is not limited to state, federal and international law and policy regarding environmental justice, civil rights and human rights,[34] recent policy decisions for environmental justice by Cal-EPA, and community members' evidence and expert opinions. All of this information should be evaluated along with the results of the local emissions concentration, air quality, exposure and potential health impact analyses described above.

The draft EIR should analyze water quality impacts.

Flares emit persistent, bioaccumulative and toxic pollutants (PBTs), including semi-volatile PAHs and mercury, and available evidence also indicates a reasonable likelihood that flares emit dioxin-like pollutants.[35] This PBT emission results in atmospheric deposition of the PBTs to surface waters and land within the catchment of the San Francisco Bay/Delta, and runoff carries the pollutants into aquatic sediment and food webs.[36] Further, these same PBTs cause significant adverse impacts in San Francisco Bay.

[32] See especially pages 3-7, 3-29 and 3-38.

[33] See e.g., CBE, 1989. Richmond at Risk: Community demographics and toxic hazards from industrial polluters; Contra Costa Building Trades Council, CBE and Shoreline Environmental Alliance, 1996. Neighborhoods at Risk: A report on industrial accidents in Contra Costa County 1989-1996; Bowler et al., 1996 as cited above; CBE/Kids Against Environmental Pollution, 2001 as cited above; CBE, 2004. Refinery Flaring in the Neighborhood; and West County Toxics Coalition and Global Community Monitor, 2005. Breathing Fire: In their own words.

[34] See e.g., the Principles of Environmental Justice (Attachment 3 to CBE's 4/11/05 comments).

[35] See discussion and references cited in Section 2 of these comments.

[36] See e.g., Gingrich et al., 2001. Atmospherically Derived Organic Surface Films along an Urban-rural Gradient. *Environ. Sic. Technol.* 35(20): 4031-4037; Landis et al., 2002. Atmospheric Mercury in the Lake Michigan Basin: Influence of the Chicago/Gary Urban Area. *Environ. Sci. Technol.* 36(21): 4508-4517; Karras, 2001. Dioxin Pollution Prevention Inventory for the San Francisco Bay. *In: Persistent, Bioaccumulative, and Toxic Chemicals II, Assessment and New Chemicals.* Lipnick, Jansson, MacKay and Petreas, eds. ACS Symposium Series 773. American Chemical Society. Distributed by Oxford University Press; CBE, 2000. Dioxins and Refineries: Analysis in the San Francisco Bay Area; Heyvaert et al., 2000. Paleolimnological Reconstruction of Historical Atmospheric Lead and Mercury Deposition at Lake Tahoe, California-Nevada. *Environ. Sci. Technol.* 34(17): 3588-3597; Liu et al., 2003. Characterization of Polar Organic Compounds in the Organic Film on Indoor and Outdoor Glass Windows. *Environ. Sci. Technol.* 37(11): 2340-2349; and 2002 Clean Water Act §303(d) designations.

Mercury and dioxin concentration in the Bay's food webs threatens the health of subsistence anglers and violates state and federal water quality standards.[37] PAH contamination of the Bay adversely impacts fish reproduction,[38] and adds to the cumulative toxicity of dioxins.[39] The persistence of PBTs worsens the impacts of flare emission fallout. PBTs' ability to cross the placenta, accumulate in breast milk, and cause concentrated prenatal and perinatal exposures further worsens these impacts. Substantial available scientific literature on sources of PBTs in aquatic food webs[40] shows that the emission-fallout-runoff pathway is a major vector for newly generated PAH, mercury and dioxin contamination of San Francisco Bay and other surface waters in the Bay Area, northern California and elsewhere.

The Initial Study fails to identify water quality impacts of flare emissions. The draft EIR should rigorously evaluate toxic fallout impacts on water quality and subsistence anglers.

The draft EIR should analyze disparate impacts of refinery upsets.

Refinery workers and neighbors suffer the most extreme air quality, hazard and hazardous materials impacts resulting from refinery spills, fires and explosions.[41] A greater portion of residents along refinery fence lines are low-income and/or people of color as compared with Bay Area communities more distant from refineries and other major pollution sources. Thus, working people and people of color are disproportionately impacted by the major upsets that an effective flare control rule could help to prevent. Therefore, alternatives that may not achieve available measures to prevent upsets (as necessary to reduce flare emissions) would worsen existing environmental injustice by resulting in additional disproportionate environmental impacts. The draft EIR should analyze environmental justice impacts that result from refinery upsets.

---

[37] See USEPA, 1999 record of decision, CWA § 303(d) designations; 2002 Clean Water Act §303(d) designations; and Karras, 2001 as cited above.

[38] See e.g., Spies et al., 1985. Reproductive Success, Xenobiotic Contaminants and Hepatic Mixed-function Oxidase (MFO) Activity in *Platichthys stellatus* Populations from San Francisco Bay. *Marine Environ. Res.* 17:117-121; Spies et al., 1988. Effects of organic contaminants on reproduction of the starry flounder *Platichthys stellatus* in San Francisco Bay: I. Hepatic contamination and mixed-function oxidase (MFO) activity during the reproductive season. *Marine Biology* 98: 181-189; and Spies and Rice, 1988. Effects of organic contaminants on reproduction of the starry flounder *Platichthys stellatus* in San Francisco Bay: II. Reproductive success of fish captured in San Francisco Bay and spawned in the laboratory. *Marine Biology* 98: 191-200.

[39] Combinations of dioxins (2,3,7,8 halogenated dibenzo-*p*-dioxins, dibenzofurans and dioxinlike PCBs) cause additive toxicity by a common mechanism initiated through binding of the compounds to the intracellular aryl hydrocarbon receptor in humans and animals. See: Van den Berg et al., 1998. Toxic Equivalency Factors (TEFs) for PCBs, PCDDs, PCDFs for Humans and Wildlife. *Env. Health Perspectives* 106(12): 775-792. PAHs can cause toxicity via binding to the aryl hydrocarbon receptor and thus worsen the toxicity of dioxins, although PAHs may also cause toxicity by a different mechanism. See e.g., Eljarrat et al., 2001. Toxic Potency Assessment of Non-and Mono-ortho PCBs, PCDDs, PCDFs, and PAHs in Northwest Mediterranean Sediments (Catalonia, Spain). *Environ. Sci. Technol.* 35(18): 3589-3594; and Reeves et al., 2001. Evaluation of Methods for Predicting the Toxicity of Polycyclic Aromatic Hydrocarbon Mixtures. *Environ. Sci. Technol.* 35(8): 1630-1636.

[40] Including but not limited to journal publications posted to web search engines and studies available from the San Francisco Bay Regional Water Quality Control Board's planning section (see e.g., TMDLs; RMP special studies).

[41] See e.g., Bowler et al., 1996 and Alton and Brown, 1997 as cited above.

Refinery fires and explosions damage process equipment and can result in unplanned shutdowns of production capacity, unplanned reliance on refined fuel storage margins, and real or perceived supply/demand imbalances that cause price spikes. Global oil prices are the dominant factor in gasoline and diesel price hikes. However, evidence compiled by the California Energy Commission (CEC) suggests that unplanned refinery process outages have contributed significantly to statewide gasoline price spikes lasting for weeks and hiking prices by 50 cents/gallon or more.[42] Impacts include cumulative effects on low-income refinery neighbors who are often least able to afford the higher fuel prices that oil companies pass on to consumers, and the spikes' secondary economic impacts on government environmental and other services.

These potential environmental and socioeconomic impacts could be avoided by actions that prevent upsets in order to reduce flare emissions. The draft EIR should evaluate these impacts.

The draft EIR should analyze feasible alternatives to the proposal.

CBE proposed a specific alternative to the proposal.[43] Plumbers and Steamfitters Local 342 proposed a second specific alternative to the proposal that CBE has reviewed.[44] The record before the District for proposed Rule 12-12 demonstrates that each of these alternatives differs significantly from the proposal (as proposed February 15, 2005), and shows that each alternative would result in superior environmental effects as compared with the February 15th proposal.[45] As compared with these feasible alternatives, the current proposal's lack of enforceable standards could result in diminished effectiveness in reducing flare emissions, air quality impacts, water quality impacts, upset risk, hazards, hazardous materials impacts, and fuel price spikes.

---

[42] See e.g., CEC and ARB, 2003. Reducing Petroleum Dependency in California. P600-03-005A4 (Page xi and Chapter 1: "Since 1996, unplanned refinery outages have often resulted in [fuel] price spikes"); CEC, 2003 Integrated Energy Policy Report at page 32 (In March 2003 a combination of record crude prices and refinery problems in California spurred a record high spike in average gasoline price); and CEC, 2003. Transportation Fuels, Technologies, and Infrastructure Assessment Report at 36 (California gasoline prices rose by 57 cents/gallon in the ten weeks leading up to this March 2003 then-record price).

[43] See 4/11/05 comments of CBE et al. as cited above, especially Attachment 2 to these comments.

[44] See 4/14/05 comments of Plumbers and Steamfitters Local 342 as cited above, especially the separately submitted attachment submitted 4/14/05 entitled "Some key recommendations on language changes to Regulation 12, Rule 12 (Flares at Petroleum Refineries)."

[45] See 4/11/05 comments of CBE et al. (no enforceable standard preventing unnecessary flaring; known feasible actions can reduce flare emissions and prevent upsets; enforceable standards are needed to stop pollution from avoidable flaring; specific sample draft language requiring such actions); 4/14/05 comments of Plumbers and Steamfitters Local 342 (feasible methods to control flare emissions; flaring prevention is an inherently safer practice; definitions and standards need more clarity to prevent routine flaring; flare minimization plans need clear standards and public review provisions; flaring during planned startups and shutdowns should be minimized; amend to include sulfur limits; specific sample draft language); 4/1/05 comments of Cal. Air Resources Board ("draft rule does not provide specific, quantifiable standards" and recommends public participation, future effectiveness improvement mechanisms); and 4/11/05 comments of USEPA ("It is unclear why flaring resulting from excess production of waste gas is being excluded from this prohibition. We recommend prohibiting this type of flaring"). Please refer to full comments.

Comments of CBE on scope of flare control rule EIR **April 26, 2005**

Both the CBE alternative and the union alternative would adopt clear, enforceable standards requiring actions to avoid the need to flare during normal operations and avoid or minimize planned and emergency flaring: The February 15th proposal for Rule 12-12 would ***not*** ensure clear, enforceable standards for these outcomes.[46] Preventable flaring has caused unnecessary emissions for decades despite community concerns in the absence of such standards.[47] This is strong evidence that the alternatives could better achieve the project's purpose.

Further, both of these alternatives would define enforceable standards through decisions made during the formal public process for rule development, and make these key decisions based on publicly verifiable information: the February 15th proposal for Rule 12-12 would not.[48] Thus, the proposal could unnecessarily limit public participation by disproportionately impacted low-income communities of color in a key decision affecting these communities' health and welfare. This would adversely affect public participation rights, civil rights and environmental justice. Therefore, the proposal could result in significant adverse impacts.

The draft EIR should identify and evaluate these potential impacts of the proposal, and compare the proposal with the alternatives identified by CBE and Plumbers and Steamfitters Local 342. The alternatives should be evaluated for their ability to avoid or mitigate impacts of the proposal on public participation rights, civil rights and environmental justice. The alternatives should also be evaluated for their ability to better reduce flare emissions, air quality impacts, water quality impacts, upset risk, hazards, hazardous materials impacts, and fuel price spikes.

[46] See comments of CBE et al., Plumbers and Steamfitters Local 342, USEPA and ARB as cited above.
[47] See 4/11/05 comments of CBE et al. on the draft rule as proposed 2/15/05.
[48] See comments of CBE as cited above; and Rule 12-12 as proposed 2/15/05, especially §§ 402, 403, 408. In addition, both the CBE alternative (CBE comments, Attachment 2) and the labor union alternative (Some key recommendations on language changes to Regulation 12, Rule 12) would allow more public participation in the implementation of the rule after adoption (see proposed alternatives regarding §§ 402, 403). Note, however, that such participation could still be severely limited by lack of access to confidential information; and a "war of attrition" that puts low-income communities with less resources than oil companies, and would already lack access to confidential data, at further disadvantage.

11/19/04

To: Adrienne Bloch, CBE Staff Attorney, AJ Napolis, N. Cal. Director,
Greg Karras, Senior Scientist

From: Julia May, Environmental Consultant

Re: **Review of BAAQMD Reassessment of Flare Emissions for Historical Study Period** (6/1/01 – 8/31/02)

This review relates to a historical time period used for assessing flare emissions (6/1/01 – 8/31/02), a time when the refineries were not required to monitor flare gases. The accuracy of the monitoring in place during that time varied greatly between different refineries, and none of it was required to follow a specific District protocol. The District made its earlier estimate of 22 tons per day based on the best information available to the District at the time, and I believe it was a reasonable estimate to make. The District has since re-assessed these emissions, based on extreme pressure from the refineries. Some of the new information is better information, some of it is highly suspect.

I evaluated the calculation changes made by the District to reach the new estimate of 8 tons per day of total organics (including 5 tons of NMHC – non-methane hydrocarbon, , and 3 tons of methane – CH4). The original estimate was 22 tons per day of total organics, with no separation of NMHC and CH4 (methane).The District *should* be controlling methane as well as non-methane compounds. (A Harvard study found that human-generated methane sources are a global contributor to ozone formation, much more than previously thought See our Flare Report, appendix. Methane is also an important greenhouse gas.)

I did not review the District's sulfur oxide emissions estimate, because the calculation of this number is not as impacted by controversy as the estimate for VOCs. One reason for this is that whatever sulfur compounds that are in the flare are still sulfur compounds when they are emitted, no matter what the combustion efficiency is. With high combustion efficiency, you get more SOx, if combustion is poor, you get more hydrogen sulfide coming out (which is worse than SOx), but in either case, it's all hazardous sulfur compounds. Note also that average daily emissions could well be much higher.

The following changes were made to reach the new lower emission estimate. Also see the table below, which compiles these changes.

> **The percentage of hydrocarbon in the flare gas changed** from an estimate of 75% for all refineries, to varying am ounts for each refinery, based on measured samples taken of flare gas. However, based on later assessment of actual samples, one of the refineries averaged even higher at 85% hydrocarbon (Conoco), Shell's average came close (65 %) for "Other" flares (non-flexigas flare), and Chevron had 60% hydrocarbon. Only Tesoro and Valero (at 35% each) showed much lower percent total hydrocarbon than the 75% original. Thus the 75% number originally used for total hydrocarbon percent was a reasonable approximation based on engineering judgement. (New figures if based on well-controlled monitoring could represent an improvement over the original estimate, but we have no indication that the new monitoring data has been fully audited by the District for quality. In fact, the District stated in earlier workshops that there were many

1

inconsistencies in the new monitored data.). Here are the specific impacts on the new estimation, caused by the percent hydrocarbon change:

- **Tesoro had almost 7 tons per day less estimated emissions** caused by lowering the total hydrocarbon content down to 35% (21% methane, 14% NMHC) based on sampling, from the original 75% the District used. This had a huge effect on the emission estimate because Tesoro represented such a big chunk (13 tpd out of 22 tpd total). During earlier workshops at the District, Tesoro had argued that hydrocarbon content was lower than 75%, but refused to provide CBE with the raw sampling data. At the time, they stated that they took samples every day at 3 am, a practice which could provide unrepresentative data. However now that they are required to monitor and sample the flare gases, their estimate, if monitored properly, should be more accurate. Tesoro's sampling techniques should be thoroughly reviewed, and the raw data provided to CBE, in order for CBE to accept this hydrocarbon percentage, which has resulted in the single largest source of the reduced emission estimate below the 22 tpd.
- **An additional reduction of 0.4 tpd occurred for Tesoro because the pilot & purge gas estimate went down** to 200,000 standard cubic feet per day, (from 0.7 total hydrocarbon down to 0.09 tpd total hydrocarbon, which includes 0.01 tpd NMHC, and 0.08 tpd methane).
- **Valero had almost 1 ton per day less estimated emissions** caused by a lowering of the hydrocarbon down to 35% total hydrocarbon (11% methane, 24% NMHC)
- **An additional reduction of 0.4 tpd occurred for Valero because the pilot & purge gas estimate went down** to 50,000 standard cubic feet per day, (from 0.7 total hydrocarbon down to 0.02 tpd : 0 tpd NMHC, and 0.02 tpd methane).
- **Conoco had about 0.1 tpd less emissions estimated due to more than one change in hydrocarbon percent and related issues.** Hydrocarbon percent for flaring events went up to 85% from 75%, causing an increase in the emissions estimate of about 0.5 tpd average, but the amount of pilot and purge gas in the flare gas went down from 800,000 standard cubic feet per day to 200,000, and its percentage went up to 100% total hydrocarbon but only 4% NMHC, causing a reduction in the emissions estimate of about 0.6 tons per day (from 0.7 total hydrocarbon down to 0.09 tpd : 0.01 tpd NMHC, and 0.08 tpd methane).
- **Shell also had about 0.4 tpd less emissions estimated due to more than one change in hydrocarbon percent and related issues.** Hydrocarbon percent for flaring events went down a bit to 65% from 75%, but had less affect. However, the amount of pilot and purge gas in the flare gas went down from 800,000 standard cubic feet per day to 200,000, and its percentage went up to 100% total hydrocarbon but only 4% NMHC, causing a reduction in the emissions estimate of about 0.6 tons per day (from 0.7 total hydrocarbon down to 0.29 tpd : 0. 26 tpd NMHC, and 0.02 tpd methane, with rounded figures).
- **Chevron –No impact** by the lowering of hydrocarbon down to 60%, because Chevron emissions were completely left out of the original assessment.

- **Large flaring events were left out of the new estimate**:
  - **Tesoro -- average of 1 tpd reduction by subtracting out largest flaring events** (0.25 ton per day average CH_4, 0.75 ton per day average NMHC). Tesoro

claimed during workshops that their old flow monitoring devices sometimes failed, by pegging high. They claimed they have corroborating pressure data to prove that these flaring events did not happen. However, this is not supported by publicly verifiable data. Tesoro should not be allowed to submit data as it did, and then two years after the fact claim they were wrong without verifiable proof. To be minimally conservative about public health, these flaring events should be replaced.

- **Conoco's -- 0.2 tpd reduction by lowering estimation of Conoco's biggest flaring event.** The 134 tpd July 10, 2002 event, (earlier reported as even higher: 480-720 tpd) was re-estimated down to 50 tpd. This is the 2nd lowering of this estimate. The new estimate was based on an increase in hydrocarbon percentage, but a big change in flare efficiency up to 98% (when 90% was used to get the 134 tpd estimate), reducing emissions greatly. There is no technical support for assuming 98% efficiency for this unusual event that shut down the entire refinery, flooded the system with all the gases, and was smoking severely. In general, smoking means too much hydrocarbon compared to the amount of air available for mixing, which in general means poor combustion. According to AP-42, Ch 13.5, Industrial Flares, Chapter 13.5.1, *"The tendency of a fuel to smoke or make soot is influenced by fuel characteristics and by the amount and distribution of oxygen in the combustion zone. For complete combustion, at least the stoichiometric amount of oxygen must be provided in the combustion zone."*

  At any rate, this flare event should be increased beyond the 134 tpd, by using the increased percent hydrocarbon now identified for Conoco of 85%, and by reducing the efficiency back down to at least 90%, and this could go much lower. This would result in an increase for this event from 134 tpd up to 255 tpd total organics, including 177 tpd NMHC. When included in the historical time period, this would increase the average total hydrocarbon by another 0.42 tpd average, including 0.29 NMHC.

- **Other changes & notes:**
  - **Chevron flare emissions were *added* to the new emission estimate, increasing it by 0.76 tpd.** Originally, Chevron data was completely left out.
  - **Historical time period was standardized to cover the same period for all refineries, but this left out same data** originally submitted by different refineries.
  - **The reason should be explored for the pilot and purge gas amount changes discussed above** from 0.8 MMSCF (million standard cubic feet, or 800,000 scf), for the original TAD estimate, down to lower amounts for different refineries (mostly accounted for in above sections). What was the reason for this change? Was the TAD number an estimate used across the board, and the new numbers more specific, or were there actual changes made?
  - **BAAQMD used 98% efficiency across the board** with the exception of Shell's flexigas flare (using low grade fuel), where 90% combustion efficiency was used.
  - **It appears that a potential change to original flow data advocated by Conoco was not made, but this should be confirmed.** Earlier, ConocoPhillips claimed that for one of their flow meters, the wrong scale had been read, causing the flow

to be overestimated by a factor of ten for some flaring events. It did not appear that the flows were different for Conoco compared to the original TAD, but I could not determine for sure whether flow data was altered from original submissions. If this was the case, it could explain more of the reductions in Conoco's new emissions estimate.

- **There were an approximate 4 tpd average reduction** in the emissions estimate from changes we did not yet identify.

APPENDIX B

What changes did the BAAMQD make to get the new flare emission estimate for the Historical Period studied (6/1/01 – 8/31/02)

Facility, # flare events	**Tesoro - 457**	**Conoco – 140**	**Shell - 233**	**Valero - 457**	**Chevron - 248**	**Total**
District original estimate total HCs	**13** tpd average (120 tpd Max)	**4** tpd average (134 tpd Max)	**3** tpd average (11 tpd Max)	**2** tpd average (40 tpd Max)	Was not included in 22 tpd estimate -- data was not submitted in time	**22 tons per day average**
Current hydrocarbon % used in recalculation of historical emission estimate has changed *(Original District 22 tpd used* **Total HC 75%** *as estimate except for Shell Flexigas flare Now % based on samples of measured data.)*	**Total HC 35%** (CH_4: 21%, NMHC: 14%) **Change to lower total HC reduces estimate by 6.9 tpd** (reduced to 35/75 x 13tpd) The amount of pilot and purge gas also changed from 800,000 scf down to 200,000 scf per day used for the new estimate **Changes for pilot & purge gases resulted in 0.4 tpd less emissons**	**Total HC 85% for flaring events** (CH_4: 46%, NMHC: 39%) **Total HC 100% for pilot & purge gases** (CH_4: 96%, NMHC: 4%) The amount of pilot and purge gas also changed from 800,000 scf down to 200,000 scf per day used for the new estimate **Change to higher total HC increases estimate by 0.5 tpd** (=85/75 x 3.3tpd flaring event emissions) **Changes for pilot & purge gases resulted in 0.61 less emissons** --The original 4 tpd figure was an average of 140 days of flaring events, rather than an average of all days during the time period, not including days without flaring	**Total HC:** **1.3% Flexi flare (special case), 65% Others flares** (CH_4: Flexi: 1% Others: 10%, NMHC: Flexi: 0.3% Other flares: 55%) The amount of pilot and purge gas also changed from 800,000 scf down to 200,000 scf per day used for the new estimate **Changes for pilot & purge gases resulted in 0.4 tpd less emissons** Since emissions from "Other Flares" flare events was a small part of original estimate, % HC change made less difference on emissions.	**Total HC 35%** (CH_4: 11%, NMHC: 24%) **Change to lower total HC reduces estimate by 1.1 tpd** (=35/75 x 2tpd) The amount of pilot and purge gas also changed from 800,000 scf down to 50,000 scf per day used for the new estimate **Changes for pilot & purge gases resulted in 0.68 tpd less emissons**	**Total HC 60%** (CH_4: 25%, NMHC: 35%) This didn't subtract from 22 tpd because Chevron wasn't included at all	Minus 9.6 tpd
Other changes	Tesoro subtracted largest flaring events from their original reports. **Reduces Total HC by 1 tpd average** (0.25 ton per day average CH_4, 0.75 ton per day average NMHC)	Conoco's biggest flaring event (134 tpd event, earlier reported as even higher) was re-estimated down to 50 tpd (the 2nd lowering of this estimate). (Note 1) - **Reduces Total HC by 0.2 tpd average**			Including Chevron, originally left out: **Increases Total HC by 0.76 tpd**	Minus about 0.5 tpd from changes identified to the left. An additional approx. 4 tpd reductions to the emisson estimation occurred, from source we did not yet identify
Current District Estimate	**3.76** tpd total HC	**1.04** tpd total HC	**1.14** tpd Flexi, **0.67** tpd Others total HC	**0.47** tpd total HC	**0.76** tpd total HC	**8 tons per day** (CH_4: 3 tpd, NMHC: 5 tpd)

CH_4 = Methane, NMHC = Non-Methane Hydrocarbon, & the two added is Total HC (Hydrocarbon)

Note 1: Conoco's biggest flaring event (originally estimated by the District at 480-720 tpd, then reduced to 134 tpd) was a result of the entire refinery shutting down, and all the gases routed to the flare. The number has once more been re-calculated downward, to 51 tpd total HC (including 35 tons NMHC). The 134 tpd District estimate for 7/10/02 was based on one hour maximum capacity and 2.5 hours 90 MMSCFD and 90% efficiency.

What is the minimum level the historical estimate should be, taking into account the new information presented by the District?

- **Start with the new District estimate of 8 tons** daily average total hydrocarbon (3 tpd exempt methane, 5 tpd NMHC)
- **For Tesoro add 1 ton** daily average total hydrocarbon back for the missing flaring events (0.25 tpd methane, 0.75 tpd NMHC)
- **For Conoco Phillips add 0.42 tons** daily average total hydrocarbon (including 0.29 NMHC) for increasing the 7/10/02 largest flaring event up, beyond the original 134 tpd, to 255 tpd.
- **For Chevron add 1.25 tpd** to bring Chevron up to 2 tpd, by estimating Chevron as an average of the other refineries. This approach is at least as valid as the current approach, which merely estimates Chevron's emissions. Chevron did not have monitoring equipment in place as the other refineries did, and had to recalculate several times due to errors in the calculations. Chevron is the largest Bay Area refinery, Chevron had frequent and repeated compressor breakdowns during the historical study period, and Chevron had a large number of flaring events during the historical period (248 flaring events compared to 140 for Phillips, 233 for Shell's "Other" flares, and 457 for both Tesoro and Valero). Yet Chevron is being assessed with only 0.76 tpd of emissions for the historical period, almost the lowest level of any refinery's, total hydrocarbon for the study period. Using an average of other refineries for Chevron may actually be charitable toward Chevron.

This would result in emissions of almost 11 tpd average total hydrocarbon

What is the range for these historical emissions when the insupportable assumption that combustion efficiency never went below 98% is discarded?

- **If only 10% of these flaring events had combustion efficiency below 98%** (for example, if about 1.1 tpd of the 11 tpd calculated at 98% efficiency were down to 93% efficiency), this would result in an additional 2.75 average tons per day.
- **If only 1% more of these flaring events had very poor combustion efficiency below 98%** (for example, if about 0.1 tpd of the 11 tpd calculated at 98% efficiency were down to 80% efficiency), this would result in an additional 1 average tons per day.
- **This would result in emissions of about 14. 4 tpd average total hydrocarbon for the historical period.**
- **If larger portions of these flaring events had low combustion efficiency** (for example, if about 5 tpd of the 11 tpd now calculated at 98% efficiency were down to an average of 85% efficiency), this would result in an additional 37 average tons per day of emissions.

What are some potential problems, results, and lessons related to the *new* flare monitoring data, and some actions indicated by this data which the District should take?

- **There are inconsistencies in the data which indicate that actual monitoring may be replaced with calculated data, and other anomalies.** These issues should be clarified by the District, and a public report auditing the monitoring data in a similar fashion used by the South Coast District should be performed.
    - Valero data says it is "Pressure Corrected," indicating that there were calculations performed to get the data, rather than using actual monitored data.
    - Chevron appears to provide calculated data in the database. For example, Chevron appears to provide the hourly data as 1/24th of the daily flow, rather than the actual flow in that hour. Unless flow is constant, there could be a huge difference, and much larger volumes could come out in a short time, impacting people in the area more severely.
    - Chevron's report for March of this year gives a monthly total of negative 1,267,724 standard cubic feet. While it might be reasonable sometimes to show very small negative flow, it is unreasonable for such large and consistent negative flows. This should be investigated by the District.
    - The South Coast experience indicates that a much closer look should be taken before the monitored data is accepted, due to many other types of problems identified below.

Corrective actions suggested by this review (in addition to those under consideration in rule development):

- **For all of these reasons, there should be a public audit of new monitored data, similar to the one performed by the South Coast District.** South Coast staff comments on monitoring data are summarized below.
- New flare monitoring data showed significant levels of hydrogen sulfide, indicating large SOx emissions sources. Even for flares not subject to NSPS limits for hydrogen sulfide gas within a flare, the District should adopt new rules requiring that all flares meet at a minimum the NSP hydrogen sulfide limits (160 ppm), which would greatly reduce SOx emissions from flaring.

Additional corroboration (SCAQMD study):

The SCAQMD identified major monitoring problems after an audit of refineries' compliance and implementation of the South Coast flare monitoring rule, and **recommended rulemaking to require flare controls**. (SCAQMD "Evaluation Report on Emissions from Flaring Operations at Refineries," Version 1, September 3, 2004)

- **Contrary to previous belief, flares in the District are mainly being used for <u>non-emergency</u> situations:**

    "Although flares are designed to be used mainly during emergency releases, data reported to [South Coast] AQMD as shown in Table 4-1 shows that from the years 2000 to 2003, the total volume of gas flared due to emergencies ranged from only 2 to 14 percent of the total gas flared." (page 34)

- **Over the last four years, the majority of the reported data for flaring did not use measured data, but instead used refineries substituted data, and some refineries substituted calculations over 90% of the time!**

  "This table shows that one refinery's data substitution rate in lieu of the Rule's sample collection requirements was greater than 90 percent at times. The data substitution rate for other refineries averaged above 50 percent for the period. The [South Coast] AQMD approved two Rule 1118 plans that augmented the threshold flow rate, thus reducing the number of events for which samples were required to be collected." (page 52)

- **There is widespread non-compliance with even the current flare monitoring regulation, which has led to use of much less accurate reporting of flaring data:**

  "The [South Coast] AQMD has found substantial non-compliance with the rule and various plan requirements. Reasons for non-compliance varied. Some facilities appeared to lack resources and commitment, some appeared negligent, and ***at least one facility appeared to have intentionally failed to obtain the required information utilizing the more accurate method specified in the rule.*** *" (page 14) [emphasis added]*

  "When a required sample has not been taken, facilities have used various data substitution methods in lieu of the actual data required. ***Some of the reasons offered to explain these failures to take samples include: (1) rule compliance was too expensive, (2) operators forget to collect samples, (3) not having enough sample canisters for the number of flare events experienced, and (4) sample collection practices complied with a proposed revision to a Rule 1118 plan, rather than the plan in effect.*** *The AQMD's investigation of these and other reasons for sample collection failures is ongoing. (page 52)*

- **There are major and multiple sources of inaccuracy in measurement and calculation of the data by South Coast refiners:**

  "Many flare events, including flare events well over 30 minutes, were not sampled. Instead, less-accurate substitute data was provided. Enforcement action is proceeding in response to these violations." (page 24)

  "As will be explained in Chapter 6..., the current Rule 1118 method of quantifying emissions may not accurately estimate all emissions from flares. ...Therefore, with more frequent and consistent measurement of gas data, along with accurate flow measurements, Rule 1118 emissions data can potentially provide more accurate estimation of emissions from flares." (page 28)

  "The concentration of sulfur and higher heating value in the process gas are determined either by direct sampling or by data substitution based on historical data. For this reason, reported emissions may vary due to sampling location, data substitution method, reporting methodology changes, and monitoring equipment operational status. Additionally, concerns were raised regarding flow measurement accuracy at low gas flow velocities. In addition to flow accuracy concerns, vent gas sampling location and sampling frequency are also factors influencing the accuracy of the reported emissions." (page 14)

"Although the flow meter measures all gases vented to the flare, the way the measured volume is reported is inconsistent among the facilities. Although some facilities report all measured flows, not all facilities follow this procedure.

"Some refineries reported concerns that their flow meters may not be accurate at low flow rates. As a result some facilities do not report low flow data. *The total unreported flow may represent a significant portion of the reported flow when the low flow is summed over the entire year.*

"Some facilities report the flare gas flow subtracted by the assumed clean purge gas flow (e.g., when using natural gas as purge gas). Since the purge gas flow is not measured and some facilities use large quantities of purge gas, the reported flow after the purge gas may be unreliable.

"Although the monitoring system measures temperature and pressure and determines the molecular weigh of the vent gas stream, not all flow meter systems compensate flow using the actual measure parameters. Some systems are set up such that constant values for pressure, temperature and molecular weight are used in lieu of the actual measured values. Since the flare gas flow are reported at standard condition (i.e., 1 atmospheric pressure and 60°F as defined under Rule 102), ***uncompensated reading will under report the flow rates.*** *Therefore, if the assumed value for a specific parameter is incorrect (e.g., pressure value), the reported flow will be inaccurate.*

- **Many reductions achieved by refineries were <u>not</u> due to permanent installation of vapor recovery and other treatment, but mainly due to "best management practices" which are voluntary, and which could later change:**

  SOx emission reductions from 2000 to 2001 can be partly explained by the addition of vapor recovery compressors in one of the flare systems at one refinery. Except for a sulfur treatment system installed at one facility to reduce sulfur content of process gas sold to a nearby facility in 2003, there have been no other physical modifications to the system to expand the gas vapor collection or gas treatment to account for lower emissions in 2002 and 2003. ***In other words, emission reductions reported were not due to permanent installation of vapor recovery and treatment systems.*** *[emphasis added] Facilities indicated that the reduction in flare emissions resulted from the "best management practice"." (page 13)*

- **Sulfur oxide emissions from flaring can be large, and the majority of reported flaring was "dirty," that is, had high concentrations of sulfur compounds. This is a particular hazard to neighbors, and especially to people with respiratory diseases.**

  "Figure 4-1 shows the breakdown of reported sulfur concentrations by the number of event days. This figure indicates that the higher concentrations of sulfur compounds (greater than 40 PPM total sulfur) were present during the majority of event days. ... Figures 4-2 and 4-3 compares the recordable event days and flow amount between "dirty"[1] vent gases and "clean" vent gases for each year from 2000 to 2003, respectively. These figure shows that the majority of vent gases are dirty. ... This

[1] For the purpose of this report, the term "dirty" gas was used to identify any gas with sulfur concentration greater than Rule 431.1 limit of 40 PPM. "Clean" gas refers to gases with sulfur concentration less than 40 PPM.

figure indicates that there are significant flows with sulfur concentrations exceeding 1,000 PPM and some vent gases contain sulfur concentration in excess of 100,000 PPM. Vent gases containing high concentrations of sulfur can generate a large amount of SOx emissions even under low flow conditions." (pages 37 - 38)

The SCAQMD staff recommended flare controls based on the monitoring information:

"Although efforts have been made by many facilities to minimize flare emissions since the start of the program, there are further emission reduction opportunities and emission reduction targets that should be explored by facilities subject to Rule 1118. . . . ***Staff recommends that Rule 1118 be amended to set appropriate emission goals for facilities subject to the rule.*** *(page 14)*

- *Methods that have been employed to minimize flaring and reduce emissions include:*
    - *Installing a vapor recovery system at a facility without existing vapor recovery capability;*
    - *Increasing the vapor recovery system capacity;*
    - *Increasing the fuel gas treating system capacity; and*
    - *Implementing routine inspection and monitoring to detect leaking valves.*
- *Minimize the duration and volume of gas vented to the flares due to emergencies, planned start-ups and shutdowns, and turnaround activities. This may be accomplished by:*
    - *Improving operational and maintenance procedures to prevent upset conditions; and*
    - *Improving gas minimization plans for start-ups, shutdowns, and turn around activities. (page 15)*